

# Biological Threats: Past, Present, and Future

1346 - Plague in Kaffa

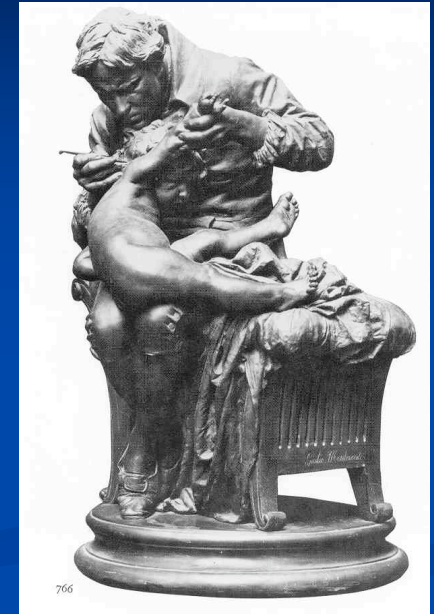


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# Pathogens, Science and Humanity

## *A Dynamic Tension*

- “Vaccination” for smallpox, cholera, anthrax, rabies (1800-1890). Death tolls decreased dramatically
- Two theories of immunology developed: cellular and humoral (1880s)
- First antibiotics (Prontosil and penicillin) were developed and shown to be clinically effective (1935-1940)
- Experimentation towards the use of microbial organisms in biological weapons (1950s-?)
- AIDS Epidemic spreads globally (1980-present)





# Public Health & Bioterrorism

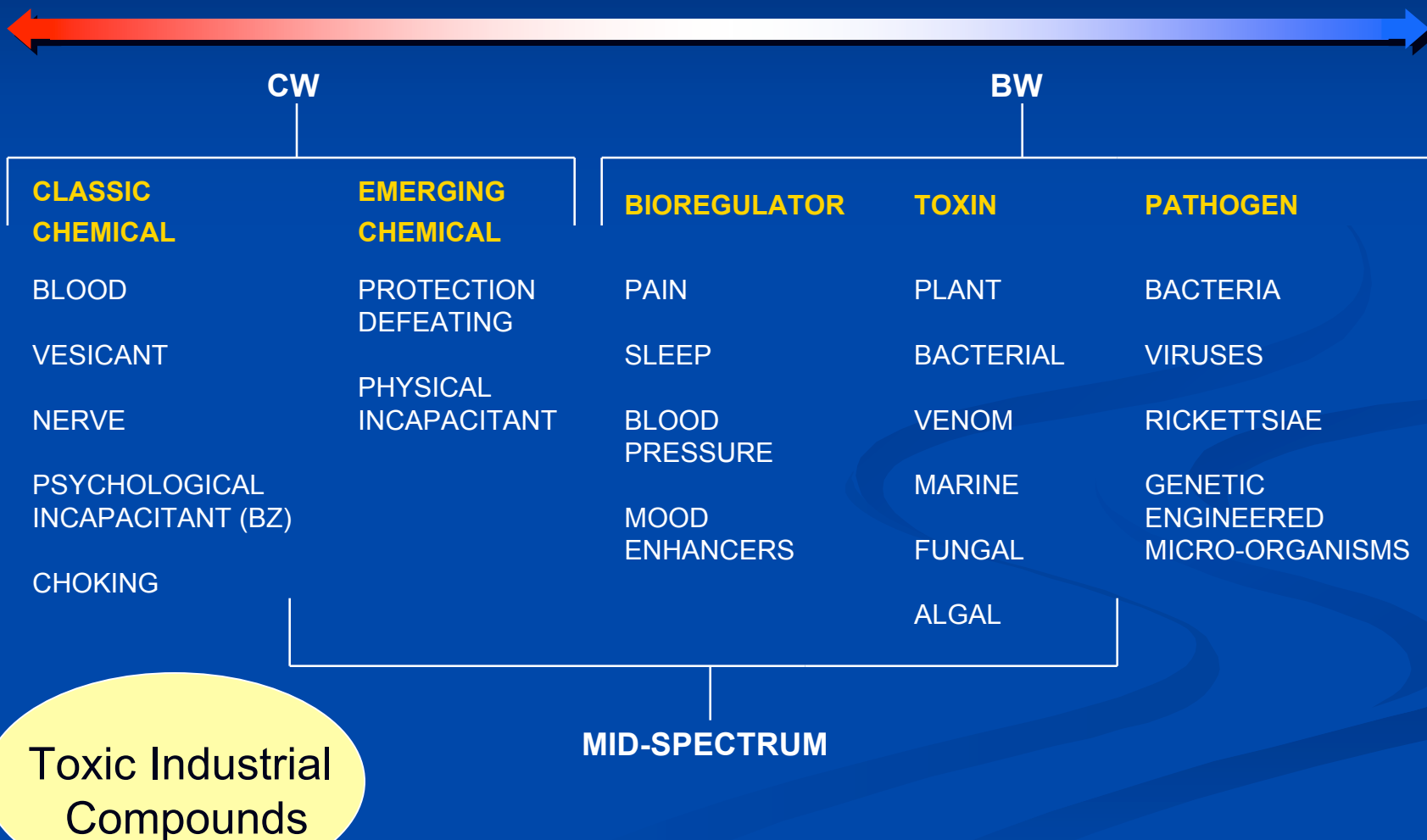


# Chemical & Biological Threat Agents

## *A Continuous Spectrum*

CLEARLY CHEMICAL

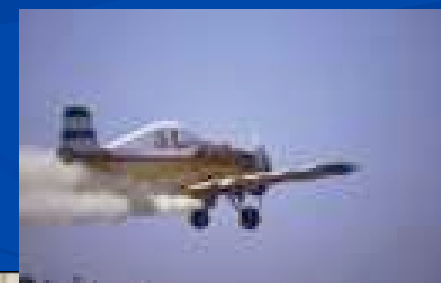
CLEARLY BIOLOGICAL



# Biological Threat

## Concepts of Use and Signatures

- Large Signature
  - Large scale production and complex deployment
- Small Signature
  - Small scale production and simple deployment
- No Signature \_ Only Intent
  - No production and simple deployment
- Concepts of Use



# Biological & Chemical Threat Reduction - *Full Spectrum Intervention*

***Preparation:*** Monitoring and Prevention

Treaties &  
Safeguards

Export  
Controls

Customs

Monitoring  
and  
Detection

Anticipation

Interdiction

Proliferant  
Nation or  
Organization

Decision  
To Acquire

Threat  
Creation

Threat  
Placement

Event/  
Attack

Escape -  
Exploitation

**Application:**  
Surveillance and Response

Surveillance and Response

Interdiction

Containment

Treatment

Mitigation

Consequence  
Management

# Bioterrorism Agents & Common Characteristics

- Ease of production
- Weaponization potential
- Environmental stability
- Communicable
  - Delayed onset of debilitating disease
  - Long duration of contagious period
- No vaccine available
- Dx and Rx of Disease Difficult and Expensive
- High morbidity and mortality
- Create fear & panic

## CDC Biological Diseases/Agents

### Category A:

- Anthrax
- Botulism
- Plague
- Smallpox
- Tularemia
- Viral Hemorrhagic Fevers

### Category C:

- Emerging pathogens

### Category B:

- Brucellosis
- Food threats
- Glanders
- Melioidosis
- Psittacosis
- Q Fever
- Ricin Toxin
- SEB
- Typhus Fever
- VEE, EEE, etc.
- Water threats

<http://www.bt.cdc.gov/Agent/agentlist.asp>

[http://www.aphis.usda.gov/vs/ncie/pdf/agent\\_toxin\\_list.pdf](http://www.aphis.usda.gov/vs/ncie/pdf/agent_toxin_list.pdf)



# Scenario-based planning and response

## *Large scale aerosol release: e.g., Anthrax*

- Diseases spread by aerosol: Viral hemorrhagic fevers, tularemia, anthrax, Q fever, plague

### **The Kameido Incident: June 29 – July 2, 1993**

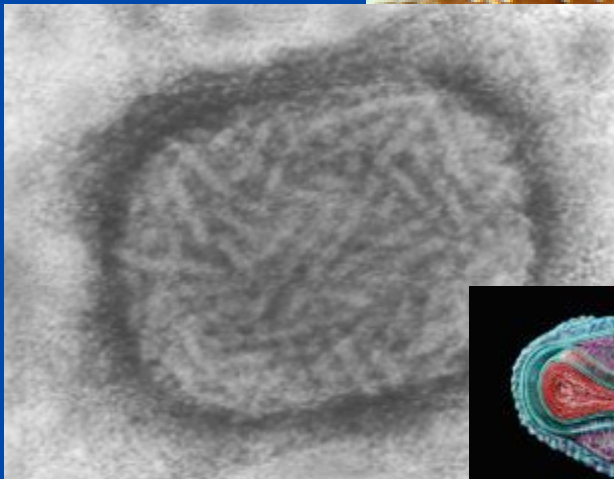
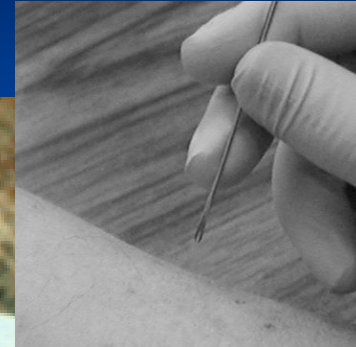




# Scenario-based planning and response

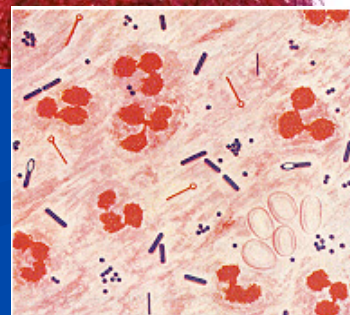
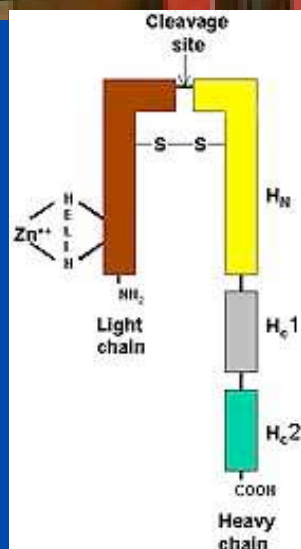
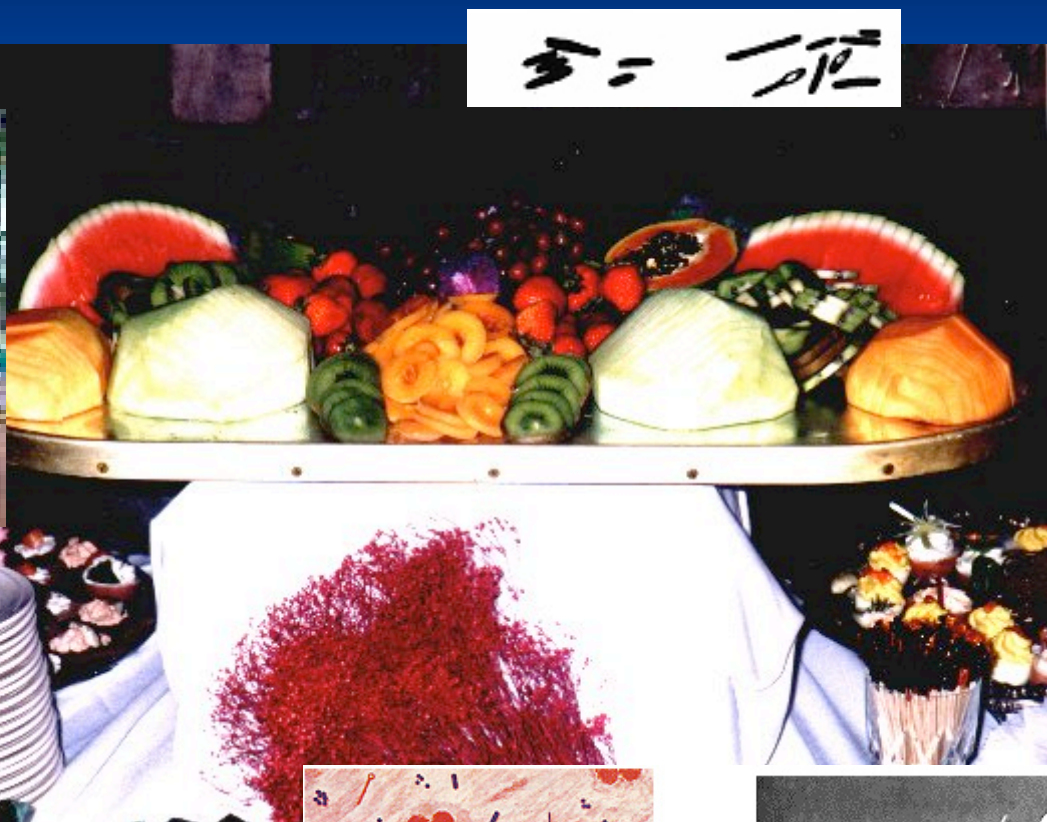
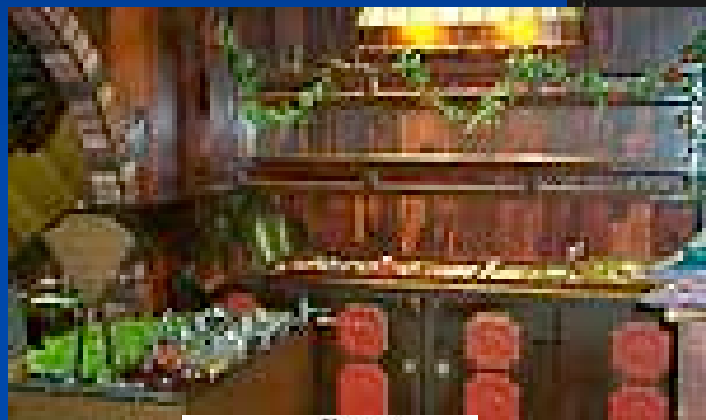
## *Highly contagious multiple releases: e.g., Smallpox*

UNCLASSIFIED



# Scenario-based planning and response

## *Food borne toxin: e.g., Botulism*

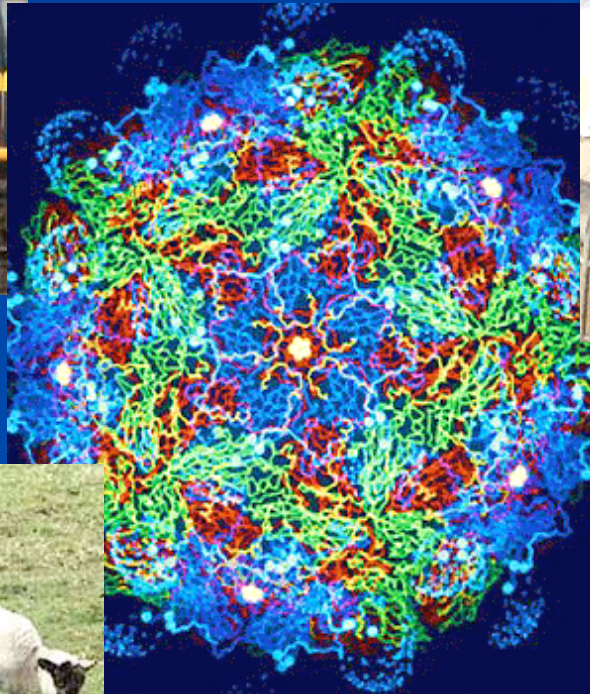




# Scenario-based planning and response

UNCLASSIFIED

## *Anti-crop/animal: e.g., Foot and mouth disease*





# Scenario-based planning and response

## *Engineered Threat: ?*

### Societal needs:

- Economic growth
- Medical care
- Food production

Drives  
Threat Surprise

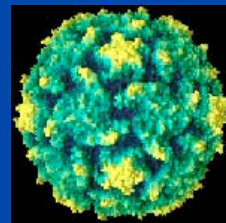
### Technology Advances:

- Biotechnology
- Genomic information
- Recombinant technology
- Nucleic acid synthesis
- Kit-based technology



Engineered threats can evade:

Create new deployment opportunities



US researchers built infectious polio virus from scratch using the genome sequence. July 2002



# Path Forward

## “National Health Security”

### Global Surveillance:

- Environmental
- Medical
- Security Related
- Novel



The diagram illustrates a path forward for national health security. At the top, a green box lists 'Global Surveillance' categories: Environmental, Medical, Security Related, and Novel. A double-headed arrow connects this box to a central blue oval labeled 'Integrated Assessment'. Below the oval, a large blue box contains two columns of 'Response' actions. A large double-headed arrow labeled 'Response' connects the two columns. The entire diagram is set against a dark blue background with a subtle wave pattern.

### Integrated Assessment

#### Public Health Response:

- Early detection of emerging disease
- Rapid Risk Assessment
- Screening and treatment
- Prevention and control

#### Security Response:

- Early detection of BT Incident
- Rapid Risk Assessment
- Appropriate Response
- Threat Containment